



Press release

Glyphosate can come from detergent additives

University of Tübingen research team produces evidence of a previously unknown source of the controversial herbicide in bodies of water

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Certain detergent additives known as aminopolyphosphonates can be transformed into glyphosate and other problematic substances when wastewater is treated. A research team led by Professor Stefan Haderlein of the Geo- and Environmental Center at the University of Tübingen has made this fundamental finding. To achieve this, the team carried out comprehensive experiments in the laboratory which also included conditions found in wastewater. The finding solidifies the suspicion that detergent additives are a significant source of the consistently high levels of glyphosate in European waters. It was previously assumed glyphosate was released into the environment almost exclusively during its use as an herbicide. The study has been published in the scientific journal *Nature Communications*.

Glyphosate is considered the most widely used active ingredient in herbicides worldwide. It prevents growth by inhibiting formation of vital component proteins in plants and many microorganisms. When it leaches from the soil, glyphosate can get into ground and surface waters as well as the environment. It is still unclear how severely this damages all sorts of life forms. Ecologists are warning of incalculable consequences. Glyphosate is only slightly toxic to the human body, but a carcinogenic effect has been the subject of discussion.

In the EU, the use of glyphosate in agriculture, above all, has been criticized. "We noticed even in areas and times when hardly any glyphosate input could be expected from agriculture, the concentrations in the water did not decrease accordingly," report Stefan Haderlein and his colleague Carolin Huhn of the Institute of Physical and Theoretical Chemistry of the University of Tübingen. They suspected this could be related to precursor substances such as aminopolyphosphonates coming from wastewater.

Aminopolyphosphonates are used in detergents as complexing agents to soften water and improve cleaning. From the standpoint of water ecology, Haderlein questions whether they are an improvement on their predecessors, which also degrade poorly. “After all, phosphates are also released from aminopolyphosphonates, which deplete oxygen in bodies of water because they promote algal growth,” he says. As an environmental mineralogist, Haderlein is interested in chemical reactions that take place on the surfaces of minerals. He explains, “We knew from an earlier project that polyphosphonates can react with and adsorb at manganese minerals.”

Manganese as a reaction driver

The current study's laboratory experiments showed manganese compounds very commonly found in soil sediments, but also wastewater and sewage sludge, are the key to a multi-stage transformation of aminopolyphosphonates, of which glyphosate is a by-product. The researcher reports, “In the lab we varied conditions, such as oxygen concentration and pH values, for example, and used wastewater in which many different substances could influence the reactions with manganese. Yet from DTPMP – the most important representative of the aminopolyphosphonates – we always got glyphosate, already with tiny amounts of dissolved manganese as long as oxygen was also present. And with mineral manganese, even in the absence of oxygen.” Haderlein also questions previous laboratory results for the microbial decomposition of aminopolyphosphonates. He notes, “Manganese is mostly present in the nutrient media for the microorganisms.” As a result, what was supposedly observed as a biological breakdown of aminopolyphosphonates could be a purely chemical process, he continues.

“Now, we've produced the proof certain aminopolyphosphonates which are used in detergents yield glyphosate in the presence of manganese. This is an important step. Next, we must test which role this glyphosate source plays in terms of quantity,” says Haderlein, summarizing the status of the team's research. He goes on, “To do that, we need still better understanding of how environmental conditions in water and wastewater systems influence the quantity of glyphosate produced during the reaction of DTPMP and manganese.”

“With their research, Professor Haderlein, Professor Huhn and their colleagues have uncovered very exciting relationships that are attracting a great deal of attention from the interested public. The results are to help to better protect our environment,” says Professor Dr. Dr. h.c. (Dōshisha) Karla Pollmann, President of the University of Tübingen.

Publication:

Anna M. Röhnelt, Philipp R. Martin, Mathis Athmer, Sarah Bieger, Daniel Buchner, Uwe Karst, Carolin Huhn, Torsten C. Schmidt & Stefan B. Haderlein: Glyphosate is a transformation product of a widely used aminopolyphosphonate complexing agent. *Nature Communications*, <https://doi.org/10.1038/s41467-025-57473-7>

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